CLAIMS

WHAT IS CLAIMED IS:

1. A transducer for converting between mechanical vibration and electrical signal, comprising:

a housing enclosing a substantially cylindrical permanent magnet and a coil, the magnet comprising a top end, a bottom end and a curvilinear side surface;

wherein the magnet is configured to have a side-to-side polar orientation .

2. The transducer of claim 1, wherein:

the magnet comprises a central axis passing through the middle of the top and bottom ends; and

the magnet includes one north pole and one south pole disposed along a line that is substantially perpendicular to the central axis.

3. The transducer of claim 1, wherein the magnet is attached to the housing via a diaphragm.

4. The transducer of claim 3, wherein the diaphragm permits allows the magnet to vibrate linearly and rotationally within the housing.

5. The transducer of claim 1, wherein the magnet is adapted to vibrate both linearly and rotationally within the housing.

6. The transducer of claim 5, wherein the vibration of the magnet induces current changes in the coil.

7. The transducer of claim 1, wherein the housing includes a bobbin portion that constrains the coil to the housing.

8. A transducer for converting between mechanical vibration and electrical signal, comprising:

a housing enclosing a substantially cylindrical permanent magnet and a coil, the magnet comprising a top end, a bottom end and a curvilinear side surface;

wherein the magnet is suspended in ferrofluid within the housing.

9. The transducer of claim 8, wherein the magnet is configured to have a side-to-side polar orientation.

10. The transducer of claim 8, wherein:

the magnet comprises a central axis passing through the middle of the top and bottom ends; and

the magnet includes one north pole and one south pole disposed along a line that is substantially perpendicular to the central axis.

11. The transducer of claim 8, wherein the ferrofluid acts as a liquid spring for the magnet.

12. The transducer of claim 8, wherein the ferrofluid is adapted to damp external vibrations that cause the magnet to vibrate.

13. The transducer of claim 8, wherein the ferrofluid comprises a natural or synthetic oil.

14. The transducer of claim 8, further comprising a metal insert embedded within the housing.

15. The transducer of claim 14, wherein the metal insert prevents the magnet from freely spinning within the housing.

16. The transducer of claim 8, wherein the vibration of the magnet induces current changes in the coil.

17. The transducer of claim 8, wherein the housing includes a bobbin portion that constrains the coil to the housing.

18. A sensor array for a musical instrument having a soundboard, comprising:

one or more sensors for converting between mechanical vibration and electrical signal, each sensor comprising a transducer including a housing enclosing a substantially cylindrical

permanent magnet and a coil, the magnet comprising a top end, a bottom end and a curvilinear side surface;

wherein each magnet is configured to have a side-to-side polar orientation.

19. The sensor array of claim 18, wherein the sensors are oriented substantially in the same direction.

20. The sensor array of claim 18, wherein each sensor is attached at a distinct location on the soundboard.

21. The sensor array of claim 20, wherein the placement of the sensors takes advantage of the natural phase relationship of the soundboard.

22. The sensor array of claim 18, wherein the sensors are wired to an amplifier.

23. The sensor array of claim 18, wherein the sensors are attached to an interior surface of the soundboard such that each sensor is substantially hidden from view during use of the musical instrument.

24. The sensor array of claim 18, wherein the musical instrument is a guitar.

25. The sensor array of claim 18, wherein each sensor further comprises ferrofluid that fills the housing and substantially surrounds the magnet.

26. The sensor array of claim 25, wherein the ferrofluid acts as a liquid spring for the magnet.

27. The sensor array of claim 25, wherein the ferrofluid is adapted to damp external vibrations that cause the magnet to vibrate.

30. The sensor array of claim 25, wherein the ferrofluid comprises a natural or synthetic oil.

31. The sensor array of claim 18, wherein each sensor further comprises damping fluid filling the housing and substantially surrounding the magnet.